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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/701,534	11/30/2000	Shunichi Seki	107291	5481

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OLIFF & BERRIDGE, PLC
P.O. BOX 19928
ALEXANDRIA, VA 22320

EXAMINER

CLEVELAND, MICHAEL B

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 07/23/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/701,534

Applicant(s)

SEKI ET AL

Examiner

Michael Cleveland

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 November 2000.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4. 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 4, 13, and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4: The terms “the heat treatment” and “the light treatment” lack proper antecedent basis in the claims.

Claims 13 and 22: The phrase “...the concentration being [having] a viscosity...” is unclear. (It appears that “concentration” should have been “composition” in the original claims.)

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-5 and 14 are rejected under 35 U.S.C. 102(a) as being anticipated by Yudasaka et al. (U.S. Patent 5,989,945, hereafter ‘945).

Claims 1 and 14: ‘945 teaches a method for forming a silicon film for a device such as a thin film transistor (Abstract) comprising:

applying a coating solution (i.e., an ink composition) containing a silicon compound onto a substrate (col. 14, line 60-col. 16, line 16; Abstract). The solution may be deposited by ink-jet printing (col. 20, lines 35-40).

Claim 2: The solution coating may take place under an inert atmosphere (col. 16, lines 29-31).

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Claim 3: The solvent is evaporated (i.e., removed) after deposition (col. 14, lines 4-12) and the film is pyrolyzed (col. 15, lines 10-26).

Claim 4: The silicon film may be crystallized by laser treating to form a crystalline film (col. 15, lines 6-26).

Claims 5 and 14: The solution may contain Si_3H_8 (col. 14, lines 60-67).

5. Claims 1-5 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Yudasaka et al. (WO97/43689, hereafter '689) for substantially the same reasons given above (WO97/43689 is the international application from which '945 matured.).

6. Claims 15 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Margrave et al. (U.S. Patent 3,379,512, hereafter '512).

'512 teaches liquid compositions (col. 2, lines 6-23) that contain Si_3BF_9 , $\text{Si}_4\text{BF}_{11}$, and $\text{Si}_5\text{BF}_{13}$ (col. 2, lines 55-65). Liquid compositions are ink-jet printable.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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9. Claims 6-7, 9, 15-16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yudasaka '945 in view of Margrave '512.

Claims 6, 9, 15, and 18: '945 teaches the formation of semiconductor silicon thin films, but does not teach the use of a compound containing silicon and either boron or phosphorus to deposit the silicon films.

'512 teaches liquid compositions containing perfluoroborosilanes, such as $\text{Si}_4\text{BF}_{11}$ and $\text{Si}_5\text{BF}_{13}$ (col. 2, lines 41-65) and teaches that the taught compounds decompose to form silicon films (col. 7, lines 6-10). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a solution of the silicon precursors of '512 instead of the silicon precursors of '945 with the expectation of similar results and with a reasonable expectation of success because '512 teaches that its precursors are also useful for forming silicon films.

Claims 7 and 16: Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used both the silicon precursors of '945 and the precursors of '512 simultaneously to form the silicon films because both are taught as useful for that purpose. It has been held to be *prima facie* obvious to combine two compositions taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the same purpose. *In re Kerkhoven* 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980). See MPEP 2144.06.

10. Claims 8, 10-12, 17, and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yudasaka '945 in view of Kotaro et al. (JP 06-191821, hereafter '821).

'945 is described above, but does not explicitly teach using a silane with at least 5 silicon atoms, using a hydrocarbon solvent with a vapor pressure in the claimed range, or a silane concentration within the claimed range.

Claims 8 and 17: '945 teaches the use of disilane, trisilane, or tetrasilane, but not pentasilane (col. 14, lines 60-67). '821 teaches the equivalence of forming silicon films by applying liquid solutions of silanes, such as disilane, trisilane, tetrasilane, pentasilane, or hexasilane [0006]. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used pentasilane instead of the silanes of '945 with the

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expectation of similar results and with a reasonable expectation of success because '821 demonstrates that it is useful for the same purpose.

Claims 10-11 and 19-20: '945 teaches the use of an alcohol solvent (col. 14, lines 4-12), but not a hydrocarbon with a vapor pressure at room temperature of 0.001-50 mmHg. However, '821 teaches other solvents that are suitable for depositing solution of silanes to form silicon films, such as ethylbenzene [0008], a hydrocarbon with a vapor pressure of approximately 10 mmHg at room temperature (See CRC Handbook of Chemistry and Physics, 47th edn., Weast, R.C., ed., p. D-125.) It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used ethylbenzene instead of an alcohol as the solvent with a reasonable expectation of success and with the expectation of similar results because '821 teaches that ethylbenzene is a suitable solvent for depositing such silanes.

Claims 12 and 21: '945 does not teach concentrations of the silane in the solution. Therefore, one of ordinary skill in the art would have been motivated to have looked to the related art to have determined operative concentrations. '821 teaches that the silane concentrations may be 0.1-50 % by weight. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have chosen a weight percent, such as 0.1 weight percent from within the claimed range with a reasonable expectation of success because '821 demonstrates that such concentrations are operative for depositing such silanes.

11. Claims 13 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yudasaka '945 in view of Taniguchi et al. (U.S. Patent 5,667,572, hereafter '572).

'945 is described above, but does not explicitly teach using inks with the claimed viscosities or surface tensions. In fact, '945 is silent as to the viscosity and surface tension of the ink. Accordingly, one of ordinary skill in the art would have been motivated to have looked to the related prior art to determine operable viscosities and surface tensions for ink jet inks.

'572 teaches that ink jet inks (col. 1, lines 7-10) may usefully have viscosities of 1-10 cP and surface tensions of 25-70 dyn/cm (col. 9, lines 11-31). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used such values as the particular values of the viscosity and surface tension for the ink of '945 with a

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reasonable expectation of success because '572 teaches that such viscosities and surface tensions are useful in ink jet printing.

12. Claims 6-7, 9, 15-16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yudasaka '689 in view of Margrave '512 for the same reasons given above relating to Yudasaka '945 in view of '512.

Claims 8, 10-12, 17, and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yudasaka '689 in view of Kotaro et al. (JP 06-191821, hereafter '821) for the same reasons given above relating to Yudasaka '945 in view of '821.

Claims 13 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yudasaka '689 in view of Taniguchi et al. (U.S. Patent 5,667,572, hereafter '572) for the same reasons given above relating to Yudasaka '945 in view of '572.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Cleveland whose telephone number is (703) 308-2331. The examiner can normally be reached on 9-5:30 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 306-3186 for regular communications and (703) 306-3186 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MBC

MBC
July 16, 2002


SHRIVE P. BECK
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700